Do Psychopathic Personality Traits Moderate the Relationship between Stress and Moral Decision Making?

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Abstract

Research examining moral decision making has found that stress increases altruistic decisions. Further, it has been shown that psychopathic personality traits are inversely associated with altruistic decisions, while also being associated with blunted stress responses. The present study examined whether psychopathic personality traits moderate the relationship between stress and moral decision making in a healthy undergraduate sample. To manipulate stress, participants were exposed to the Trier Social Stress Test (TSST) or its low stress equivalent. Psychopathic traits were assessed using the Levenson Self-Report Psychopathy Scale (LSRP), autonomic (heart rate, blood pressure), endocrine (cortisol), and subjective stress (STAI-state) were measured throughout the session, and moral decision making was examined using the Everyday Moral Reasoning Task (EMRT). The moderated regression model examining cortisol change was significant, but the models for the other stress measures were not. Those with high psychopathic traits and large cortisol increases gave the fewest altruistic responses, while those with low cortisol increases and low psychopathic traits gave the most altruistic responses; this relationship appeared to be driven by the high stress group. It was expected that psychopathic personality traits would be associated with fewer altruistic decisions, but the finding that larger increases in cortisol were associated with fewer altruistic decisions contradicts the existing literature.

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Do Psychopathic Personality Traits Moderate the Relationship between Stress and Moral Decision Making?

Acute stress is a crucial part of our everyday lives and is something that everyone experiences in some form, whether it's preparing for a job interview or walking into an exam room. Literature on the effects of stress on everyday moral decision making is very limited, but recent research has suggested that acute stress may impact our ability to make moral decisions (Singer et al., 2017; Starcke & Brand, 2012). Furthermore, there is a lack of literature when it comes to the examination of personality factors that may play a vital role in moral decision making. The current study examined whether psychopathic personality traits play a moderating role in the relationship between stress and moral decision making.

1.1 Moral Decision Making

Moral decision making is required when we are faced with conscientiously challenging uncertainties and can be described in terms of egoistic and altruistic decisions. Egoistic decisions are based on personal desire that benefits oneself, while altruistic decisions are concerned with moral standards that benefit others (Sommer et al., 2010). Morality is not mutually exclusive with ethics, but rather it tends to social values and norms the society holds which are associated with our everyday lives (Reniers et al., 2012). Various parts of the brain are involved in the emotional and cognitive processes associated with moral decision making, especially parts of the prefrontal cortex (Starcke, Polzer, Wolf, & Brand, 2011). Moral decision making can have serious ramifications especially when others are involved, such as in an emergency situation. It thus becomes important to see how moral decision making is affected by possible external and internal factors, such as stressors and personality factors, that might have an impact on an individual's response when they are caught in a morally perplexing situation.

1.2 HPA and sympathetic responses

Stress can be experienced in various forms whether it's acute or chronic, eustress or distress, it forms a basic part of what it means to be human. Acute psychological stress can be defined as something that alters our body's homeostatic tendencies and elicits a stress response (Schneiderman, Ironson, & Siegel, 2005). Stress response is characterized by the activation of the sympathetic nervous system (SNS) and the hypothalamic-pituitary-adrenal (HPA) axis (Starcke et al., 2011). The SNS is responsible for the fast physiological changes associated with stress that are known as the 'fight/flight' response, such as increased heart rate and blood pressure (Rotenberg & McGrath, 2016). The parasympathetic nervous system is inhibited during stress, allowing blood to flow to where it is needed thus promoting the sympathetic nervous system response, which in turn increases the heart rate and blood pressure (McCorry, 2007). These changes can be measured using devices that record heart rate and blood pressure. The HPA axis is responsible for the hormonal response associated with stress, leading to the secretion of corticotropin releasing hormone from the hypothalamus, adrenocorticotropic hormone from the anterior pituitary, and glucocorticoids, specifically the key hormone cortisol, from the adrenal cortex (Pruessner et al., 2010). Cortisol, which regulates its own secretion and response through a negative feedback loop, in turn impacts physiological systems and provides more energy by increasing blood glucose levels and plays a role in immune function (Gjerstad, Lightman, & Spiga, 2018; Wirth, Scherer, Hoks, & Abercrombie, 2011). These neuro-hormonal and metabolic responses form the basis of the acute stress response.

Roles of the prefrontal cortex, the anterior cingulate cortex, the amygdala, and the hippocampus in regulating the HPA-axis have been widely investigated. It has been postulated that the structures and functions of these parts of the central nervous system are heavily involved in the stress response (Pruessner et al., 2010). The hippocampus is theorized to regulate the HPA axis through the glucocorticoid negative feedback system while the amygdala is associated with changes in the autonomic stress response (Dedovic, Duchesne, Andrews, Engert, & Pruessner, 2009).

1.2 Stress and moral decision making

A recent study observed positive associations between stress-induced cortisol increases and altruistic decision making, suggesting that acute stress and increased cortisol levels have prosocial effects on everyday moral decision making in males (Singer et al., 2017). Supporting this relationship, Starcke and Brand (2012) concluded in their review that brain regions underlying decision making are sensitive to stress-induced changes. The review article looked at studies which defined decision making as an alternative between two choices and found an association between stress and decision making. The correlation between the two was not always in the same direction and whether the effects of stress were positive or negative was dependent on the situation and the task. Neuroimaging studies have also demonstrated that both cortical and subcortical brain regions involved in moral decision making are influenced by stress and cortisol levels, such as the amygdala, ventro-medial prefrontal cortex, anterior cingulate, and the hippocampus (Dedovic, D'Aguiar, & Pruessner, 2009; Fumagalli & Priori, 2012); an increase in activity is observed throughout these regions during both the stress response and moral decision making. Nonetheless the relationship between stress and moral decision making is not a simple one and there are many factors that may influence it. To date, only one study has investigated the role of personality factors as covariates in the relationship between stress and moral decisions, using the Big Five personality factor questionnaire, which represents five dimensions of personality: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness (Singer et al., 2017). The study found that the results remained the same after controlling for the personality covariates, suggesting that the five dimensions did not affect the outcome. However, they did find a significant role of the agreeableness trait in their regression model, but did not run any further analyses. While they included some traits as covariates, Singer et al. (2017) did not look for a modulating relationship personality traits might play on the outcome of moral decision making. The present study will expand on this literature by examining psychopathic personality traits and their potential role as a moderator of the relationship between stress and altruistic decision making.

1.3 Psychopathy

Psychopathy is a personality disorder that falls under the broader diagnosis of Antisocial Personality Disorders (DSM-V; American Psychiatric Association, 2013) and is comprised of four core features: interpersonal manipulation, callous affect, erratic lifestyle, and criminal tendencies (Hare, 2003; Skeem et al., 2011). While psychopathy as a diagnosis on its own is not recognized by the Diagnostic and Statistical Manual of Mental Disorders (DSM), it is listed as a specifier for antisocial personality disorders which is modeled after these features. As a result, there is no conclusive diagnostic criteria for psychopathy, however individuals recognized as such exhibit various combinations of these core traits (Strickland, Drislane, Lucy, Krueger, & Patrick, 2013). Psychopathy is characterized by symptoms which affect all aspects of the sufferer's life and include: shallow affect, lack of empathy, lack of guilt, impulsivity, and irresponsibility (Kiehl & Hoffman, 2011). As a result, psychopathy is known to be associated with severely disrupted moral decision making (Glenn, Koleva, Iyer, Graham, & Ditto, 2010; Glenn, Raine, & Schug, 2009).

Psychopathy is not limited to any culture and is observed worldwide. In fact, it is twice as common as schizophrenia and bipolar disorder, and roughly as common as panic disorders and obsessive-compulsive disorders, occurring in approximately 1% of the general population and 16% of the prison population (Kiehl & Hoffman, 2011). While research has been conducted on prison populations to better understand psychopathy, psychopathic traits are not limited to those who end up being incarcerated. Individuals possessing psychopathic traits can be found throughout the community, including university and college populations (Johnson, Mikolajewski, Shirtcliff, Eckel, & Taylor, 2015; O'Leary, Loney, & Eckel, 2007; O'Leary, Taylor, & Eckel, 2010). The research on non-incarcerated individuals with psychopathic personality traits is very limited and there is a lot more that needs to be understood, since not all psychopaths are incarcerated or criminally inclined (Gao & Raine, 2010). Of those who are inclined towards crime, the recidivism costs alone (excluding indirect costs) surpass the total costs associated with alcohol and substance abuse disorders—in the United States, $460 billion USD per year in criminal social costs are associated with crimes committed by individuals with psychopathy, as compared to $329 billion USD due to alcoholism and other substance abuse disorders (Kiehl & Hoffman, 2011). These numbers suggest more research needs to be done in order to develop effective treatment strategies and interventions to try to reduce the burden these traits are adding to the economy. Moreover, the associations between psychopathy and cortisol response (Johnson et al., 2015) as well as psychopathy and moral decision making (Glenn et al., 2009; Glenn et al., 2010) makes it a justified variable to consider as a moderating factor between stress and moral decision making.

1.4 Psychopathy and stress

The relationship between psychopathy and stress has been examined recently and results have suggested psychopathic traits are associated with blunted cortisol responses in incarcerated individuals (Johnson et al., 2015) as well as in college students (O'Leary et al., 2007; O'Leary et al., 2010). Studies conducted by O'Leary and colleagues (2007, 2010) used the Trier Social Stress Test (TSST; (Kirschbaum, Pirke, & Hellhammer, 1993) to induce stress and the Levenson Self-Report Psychopathy Scale (Levenson, Kiehl, & Fitzpatrick, 1995) to assess psychopathic personality traits. Results demonstrated a blunted cortisol response post stress induction in males with high psychopathic scores on the LSRP. Moreover, studies have shown a decreased response activity in the anterior cingulate cortex of psychopathic individuals (Abe, Greene, & Kiehl, 2018), with high psychopathic scores predicting decreased activity in the anterior cingulate cortex during dishonest decision-making. This is a further indication of the relationship between psychopathy and stress.

Another aspect of psychopathy and stress that lacks research is the role of sex—existing literature is contradictory in this respect. Findings by O'Leary et al. (2007) suggest a sex-specific cortisol production profile, as reduced cortisol reactivity was not seen in females endorsing psychopathic traits. However, there is evidence suggesting diminished cortisol levels in adolescent women with antisocial personality or conduct disorder (Pajer, Gardner, Rubin, Perel, & Neal, 2001), suggesting that the relationship between cortisol levels and psychopathy may not be sex-specific.

1.5 The present study

The present study aimed to contribute to the current literatures on stress, moral decision making, and psychopathy in several aspects. The primary purpose of this study was to determine whether psychopathic personality traits moderate the relationship between stress reactivity and moral decision making in an undergraduate sample. This particular relationship has not yet been looked at and may be important for understanding which underlying factors can explain the relationship between stress and moral decision making. It was expected that psychopathic personality traits would moderate the relationship between stress reactivity and altruistic decisions, meaning that individuals with high cortisol levels would not always make altruistic decisions and that psychopathic traits would modulate the relationship. Secondly, this study attempted to recruit both male and female participants to determine whether there is a sex difference in this relationship. It was expected that the moderating relationship would be demonstrated in males, but that it may not be seen in females, as current research on females is lacking and is inconsistent.

This study also controlled for other personality variables, such as empathy, which has an equivocal relationship with morality; existing literature suggests that while in certain cases empathy can act as a precedent for moral behaviors, at other times it can interfere with this seemingly linear relationship and result in immoral decision making (Decety & Cowell, 2014). Moreover, anxiety and depressed mood were also controlled for. Lastly, this study also controlled for potentially dishonest responses by using a measure of socially desirable response tendencies. By controlling for all these factors, this study was unique in its methodology and adds to the current literature on stress, psychopathic personality traits, and moral decision making.

Method

2.1 Participants

With a medium estimated effect size (setting alpha at .05 and power at .80), 152 participants were predicted to be required in order to detect differences between the high and low stress groups (Cohen, 1992). A total of 45 participants were recruited through the University of Regina Department of Psychology Pool of Research Participants and were compensated with a 2% mark towards a 1st or 2nd year psychology course of their choice. Out of the 45, three participants dropped out and ten were omitted based on exclusion criteria. The 33 remaining participants were between the ages of 18-31 years (mean age: 20.98 years, SD: 2.48; 6 males) to control for any age-related cortisol differences (Lupien et al., 1994). Exclusion criteria included: habitual smokers or nicotine users; intake of steroid hormone supplements in the past 3 months, including hormonal contraceptives; hormonal illnesses or diseases, psychiatric illnesses, or chronic medical conditions. All of these factors are associated with atypical cortisol levels (Broersen et al., 2015; Cohen et al., 2007). Moreover, individuals with psychiatric illnesses or medical conditions may have had an adverse reaction to the stress manipulation therefore they were excluded as well. Participants with oral injuries or diseases that could cause bleeding or high levels of bacteria were also excluded from the study, as these factors affect the integrity of the hormone assay.

2.2 Stress Manipulation

2.2.1 Trier Social Stress Test (TSST). The TSST is a widely used standardized protocol to induce moderate stress in laboratory settings and does not pose any risks to healthy individuals (Kirschbaum et al., 1993). The TSST is a 12 minute long motivated performance task which consists of a 2 minute speech preparation period, followed by a 5 minute speech in which participants talk about why they would be the perfect person for their dream job, and ends with a 5 minute oral serial subtraction task. The TSST was performed in front of a panel of two judges who asked further questions and, if required, prompted the participants to speak for the entire 5 minute period of the speech if they had stopped earlier than the 5 minute mark. The placebo (PTSST) is the low stress control condition which is comparable to the TSST in terms of duration and procedure. The participants in this group prepared for 2 minutes and then performed a 5 minute speech about a favorite movie or book followed by a simple counting task for 5 minutes. For the PTSST, the participants were alone during the tasks, completing the speech and the math task by themselves in an empty room (Smeets et al., 2009).

2.3 Main Measures

2.3.1 Levenson Self-Report Psychopathy Scale (LSRP). The LSRP (Levenson et al., 1995) is a 26-item self-report scale that measures primary and secondary psychopathy based on the two-factor model used by the Hare Psychopathy Checklist-Revised (Hare, 1991). The LSRP items are rated on a 4-point Likert scale ranging from *strongly agree* to *strongly disagree*. For this study, we used the 16-item primary subscale to assess personality traits that are central to the construct of psychopathy, such as callousness, selfishness, manipulativeness, and grandiosity (Lynam, Whiteside, & Jones, 1999) with scores ranging from 16 to 64. LSRP has been validated for use with noninstitutionalized populations including undergraduate students (Levenson et al., n.d.). The primary psychopathy subscale has a demonstrated internal reliability of .84 (Lynam et al., 1999).

2.3.2 Everyday Moral Reasoning Task (EMRT). The EMRT (Sommer et al., 2010), which has been translated from the original German version, consists of 28 everyday moral conflicts that each have two response alternatives (altruistic versus egoistic). The conflicts and the response options are presented in a first-person narrative with the conflict being followed by the question “What do I do?” All the conflicts are relatable and something participants could encounter in their everyday lives. The task was presented electronically on a computer using E-prime 2.0 software (Psychology Software Tools, 2012) and participants were required to press “1” or “2” on the keyboard to indicate their responses. The response options were presented in a random order to avoid sequence effects. For scoring purposes, the percentage of altruistic decisions was calculated to determine the rate of moral decision making (Sommer et al., 2010). The EMRT has demonstrated a high external validity and is comparable to everyday real life situations (Sommer et al., 2010).

2.4 Measures of stress response

2.4.1 Endocrine stress response. A total of three saliva samples were collected for each participant and analyzed to determine cortisol concentrations. The first sample was collected before the stress induction task to determine baseline cortisol levels. The second sample was collected approximately 20 minutes after the start of TSST/PTSST because previous studies have found peak cortisol values at ~20 minutes after the onset of a stressor (Kirschbaum et al., 1993); the last saliva sample was collected at the end of the session (approximately 25-30 minutes after the start of the TSST/PTSST). The saliva samples were stored in a locked freezer until they were ready to be assayed using Salimetric's enzyme immunoassay kits. Maximum cortisol change from baseline to either the second and third collections (peak – baseline) was used for the purposes of statistical analyses. To avoid extraneous influences on cortisol levels, participants were asked to wake up at least 3 hours prior to their session; avoid caffeine, alcohol, and strenuous activities 12 hours prior to their session, and avoid putting anything in their mouths other than water 1 hour prior to the session (Salimetrics, 2016).

Cortisol levels were analyzed using the immunoassay protocol for the Salimetrics® salivary cortisol kit. Duplicates of each sample were assayed to assess internal consistency, and were then averaged. The inter-assay CV was found to be 3.59 while the intra-assay CV was 6.53. Cortisol change (Δcortisol) scores were calculated by subtracting the baseline cortisol concentration from the peak cortisol concentration for correlational purposes.

2.4.2 Autonomic stress response. A portable heart rate/blood pressure (HR/BP) monitor was used to acquire the participants' systolic blood pressure, diastolic blood pressure, and heart rate. The monitor was placed on the participant's wrist to record HR/BP remotely throughout the session. The first HR/BP reading was taken at the start of the session to obtain a baseline. A total of five HR/BP readings were taken throughout the stress induction and control condition: during the speech preparation (at 1 minute), during the speech delivery (at 1 and 4 minutes), and during the mental arithmetic/counting task (at 1 and 4 minutes). Three more HR/BP readings were recorded during the moral decision making task at 1, 4, and 7 minutes, however for some participants only 2 readings were collected during the moral decision making task. A final reading was taken at the end of the study. The heart rate and blood pressure values within each period were averaged to generate means for each and maximum change scores were computed (peak – baseline) for each of the three measures.

2.4.3 Subjective stress response. The State-Trait Anxiety Inventory (STAI) was used to measure trait and state anxiety (Spielberger et al., 1983). The STAI-trait subscale measures general feelings and includes statements like “I feel like a failure” and “I lack self-confidence”. Participants were asked to record their responses to the 20-item trait subscale before stress induction. It is rated on a 4-point Likert scale ranging from 1 = *almost never* to 4 = *almost always.* The scores from STAI-trait were recorded to determine if they needed to be used as a covariate in the analyses to account for individual differences. STAI-state subscale measures current feelings and asked participants to indicate how they were feeling ‘at the moment’. The 20-item state subscale was given twice, once before stress induction and again at the end of the session. The state subscale includes statements such as “I am tense” and “I feel frightened” that are rated on a 4-point Likert scale ranging from 1 = *not at all* to 4 = *very much so.* Total scores for each measure range from 20-80. The test-retest reliability of both the STAI state and trait has been demonstrated to be high amongst college students with a Cronbach alpha ranging from r = .73 to .86 and has a high demonstrated validity for use with college students (Spielberger, Gorsuch, & Lushene, 1970).

2.5 Control measures

2.5.1 Center for Epidemiological Studies-Depression scale (CES-D). The CES-D is a 20-item self-report measure of depressed mood (Radloff, 1977). The CES-D is rated on a 4-point Likert scale ranging from “0” – *rarely or none of the time (less than 1 day)* to “3” - *most or all of the time (5-7 days).* The CES-D contains some reversed items with a total score ranging from 0-60. The CES-D has a high demonstrated internal consistency and a satisfactory test-retest reliability over a 2-8 week period (Hann, Winter, & Jacobsen, 1999).

2.5.2 Empathy Quotient (EQ). The EQ is a short self-report measure that assesses affective and cognitive components of empathy (Baron-Cohen & Wheelwright, 2004). The EQ consists of 20 questions that are rated on a 4-point Likert scale ranging from *strongly agree* to *strongly disagree.* To avoid a response bias, half the items are worded to produce an *agree* response whereas the other half is designed to produce a *disagree* response with a total score ranging from 0-80. A high test-retest reliability is demonstrated by the EQ (r = 0.97; Baron-Cohen & Wheelwright, 2004).

2.5.3 Social Desirability Scale (SDS-17). SDS is a validated measure that was used to control for biased responses (Stöber, 2001). SDS has a high internal consistency with a Cronbach alpha of .80 and a high convergent validity with the Lie Scale of the revised Eysenck Personality Questionnaire (Eysenck & Eysenck, 1991; Ruch, 1999). Participants were asked to rate 16 items with either *true* or *false* and the ratings were summed to achieve a total social desirability score between 0 and 16. A high score on the scale is indicative of a dishonest response bias.

2.5.4 Demographics and saliva screening. Participants were also asked to fill out a demographics and saliva screening questionnaire at the beginning of the study. The demographics questionnaire gathers information on factors that may be related to individual differences in cortisol concentrations. It includes questions regarding sex, age, ethnicity, height, and weight as well as screening for medical, neurological, psychological or any other form of diseases or illnesses that may have had an effect on the results. Female participants also answered questions about oral contraceptives and their menstruation cycles to control for hormonal changes. Participants were asked to list any medications they were on and to mention if they had consumed any caffeine or nicotine recently.

2.6 Procedure

Individual sessions took place in the Behavioural Neuroscience Research Laboratory at the University of Regina (RIC 408.3) and lasted for approximately 90 minutes each. The experiments took place between 12pm and 6pm to minimize effects of diurnal cortisol fluctuations. Participants were given detailed information 36 hours prior to their session outlining how to prepare in order to maintain the integrity of the salivary cortisol concentrations. An experimental between-subjects design was used to assign 16 participants to the high stress group and 26 participants to the low stress group prior to their arrival for the session.

Once in the laboratory, informed consent was obtained using a consent form. Participants were then asked to rinse their mouths with water to prepare for the 1st saliva sample. The device for measuring heart rate and blood pressure was applied and the first reading was taken after the rinsing. Participants then completed the demographic and saliva screening questionnaire as well as some personality questionnaires (STAI-state, STAI-trait, CES-D, LSRP, and CBS). After 10 minutes they were asked to provide their first saliva sample after which they returned to completing the questionnaires.

Once they were done with the questionnaires, participants were led into another room where they participated in either the TSST or PTSST, depending on the random assignment that was conducted prior to the start of the experiment. During the stress manipulation task, a total of 5 HR/BP readings were taken. Immediately after the stress-induction task participants were asked to complete the moral decision making task during which three HR/BP readings were collected. Then, approximately 20 minutes after the start of TSST/PTSST, the second saliva sample was collected. Next, participants were asked to complete the STAI-state a second time along with the SDS and a final HR/BP reading was taken. The last saliva sample was collected at the very end after which the participants were orally debriefed and given an educational debriefing form.

Results

3.1 Preliminary Analyses

All statistical analyses were performed using the IBM® SPSS® (version 25.0) statistical software package. All testing was two-tailed and the significance level was set at $\alpha = 0.05$. All three cortisol values, the scores for LSRP, and CES-D were log-transformed before conducting any statistical analyses to correct the distributions.

To rule out the effects of any covariates on cortisol levels (BMI, age, sex, menstrual phase, STAI-trait, and CESD) independent sample t-tests were run for group variables and correlations were run for continuous variables. None of the covariates proved to be significant (all *p*s > .15). The correlations between LSRP and STAI-trait, CESD, and SDS did not produce any significant results (all *p*s > .25). It was also found that the negative correlation between EQ scores and LSRP scores was only significant in females, $r(36) = -.45$, $p < .005$. The correlation between the SDS and LSRP did not produce any significant results, $r(42) = .02$, $p = .90$. This lets us assume that the participants were being fairly honest in answering the questions on the psychopathy scale.

Independent sample *t*-tests were employed to determine whether the high and low stress groups differed in stress level changes throughout the study. Table 1 shows that the high and low stress groups significantly differed on all of the maximum change scores. Overall, both stress groups showed increased levels of subjective and physiological stress throughout the course of the study as demonstrated by the positive means (Table 2), with the exception of cortisol levels in the low stress group which decreased over time. The high stress group experienced a more dramatic increase on all the stress change scores compared to the low stress group, as demonstrated by the significant t-test results.

To determine whether the stress groups differed in their scores on the LSRP and the EMRT, independent samples *t*-tests were run (see Table 3). It was found that the differences between the stress groups were not statistically significant for the LSRP, $t(40) = -.09$, $p = .90$, or the EMRT, $t(40) = -.92$, $p = .36$. Because no significant stress group differences were found, further analyses involving LSRP and EMRT were conducted on the whole sample overall, as well as being conducted separately for each of the stress groups.

Table 1

Independent *t* tests results comparing the maximum change in sympathetic, endocrine, and subjective stress measurements between high and low stress groups. Results show that all change scores were significantly different between groups.

	t	df	p	M (SEM)	95% CI
$Cortisol_{maxchange}$	-2.34	33	.03	-.12 (.05)	[-18.53, -5.40]
$STAI\text{-}state_{maxchange}$	-3.68	40	.001	-11.96 (3.25)	[-18.53, -5.40]
$HR_{maxchange}$	-2.44	39	.02	-9.0 (3.69)	[-16.45, -1.54]
$SPB_{maxchange}$	-3.81	40	.001	-9.59 (2.52)	[-14.67, -4.50]
$DBP_{maxchange}$	-4.50	40	.001	-10.44 (2.32)	[-15.14, -5.75]

Table 2

Group means and standard errors for the stress response change scores demonstrating a significantly greater increase in stress responses in the high stress group.

	Low Stress		High Stress	
	M	SEM	M	SEM
$Cortisol_{maxchange}$	-.05	.02	.07	.06
$STAI\text{-}state_{maxchange}$	.54	1.93	12.5	2.70
$HR_{maxchange}$	15.44	1.69	24.43	3.79
$SPB_{maxchange}$	4.29	1.33	13.88	2.39
$DBP_{maxchange}$	6.96	1.26	17.41	2.15

Table 3

Means and standard errors for LSRP and EMRT scores for both stress groups

		M	SEM
	Low Stress	28.75	1.02
LSRP	High Stress	30.23	2.26
	Low Stress	64.84	2.79
$EMRT_{\%}$	High Stress	69.64	4.91

3.2 Main Analyses

3.2.1 Correlations and Moderated Regression. The main analyses included correlations between LSRP and the five stress-change measure scores. All the tests were run on the total sample as well as being run on the high and low stress groups separately. Additional exploratory correlational analyses to determine the role of sex were also run in males and females separately. The correlation between LSRP and EMRT was statistically significant, $r(40) = -0.32$, $p < 0.04$.

For the moderated regression, centred change scores for cortisol levels and LSRP scores were put in the first block and the interaction term between them was placed in the second block, with EMRT as the dependent variable. The first block was statistically significant, $F(2, 32) = 3.87$, $p = .03$, $R^2 = .20$, as was the second block, $F(3, 31) = 3.82$, $p = .02$, $R^2 = .27$. The change from the first to the second block approached significance, $\Delta F(1, 31) = 3.19$, $p = .08$, $\Delta R^2 = .08$. While the model was significant, the only statistically significant predictor in block one was LSRP ($\beta = -.33$; Table 4), while in the second block the interaction term approached significance ($\beta = -.35$). The regression models for all the other stress-change measures (Δheart rate, systolic blood pressure, diastolic blood pressure, and STAI-state) produced nonsignificant results (all *ps* $> .06$) and thus moderated regressions with the centred interaction terms were not run on these.

3.2.2 Correlations by Sex. Several correlations were run and a significant negative correlation was found between cortisol change and EMRT, indicating that participants who demonstrated larger cortisol increases had lower EMRT scores. For the males only the correlations between the EMRT and Δdiastolic blood pressure and Δcortisol were significant, $r(6) = -.82$, $p < .05$ and $r(6) = -.92$, $p < .03$, respectively. The correlation between the subjective stress measure (ΔSTAI-state) and the EMRT was nonsignificant, $r(6) = -.53$, $p > .28$. In males, the correlation between LSRP and Δcortisol approached statistical significance, $r(6) = .84$, $p = .07$. In the female subsample none of the correlations were significant (all *p*s $> .30$).

Independent samples *t*-tests were employed to see whether males and females differed significantly on all the measures (LSRP, EMRT, ΔHR, Δsystolic blood pressure, Δdiastolic blood pressure, Δcortisol levels, ΔSTAI-state) and it was found that only the LSRP scores approached significance, $t(40) = 1.84$, $p = .07$, while all the other measures were not significant (all *p*s > .14).

Table 4

Moderated regression showing the effects of LSRP, Δcortisol, and the interaction between LSRP and Δcortisol on EMRT

		t	df	p
Block 1	LSRP	-2.09	35	.05
	Δcortisol	-1.63	35	.11
Block 2	LSRP	-1.68	35	.10
	Δcortisol	-1.67	35	.11
	LSRP x Δcortisol	-1.79	35	.08

Discussion

Literature has shown that psychopathic traits are associated with blunted cortisol stress responses in males (Johnson et al., 2015) and a study done in 2017 found that a high cortisol stress response appears to be associated with altruistic decisions in males (Singer et al., 2017). Moreover, the neural correlates associated with regulating the stress response also play a role in moral decision making, such as the ventro-medial prefrontal cortex, anterior cingulate, and the hippocampus (Dedovic, D'Aguiar, & Pruessner, 2009; Fumagalli & Priori, 2012; Hänsel & von Känel, 2008; Zijlmans et al., 2018). In light of these relationships, the present study examined whether psychopathic personality traits play a moderating role in the relationship between stress and moral decision making.

It was found that psychopathy and moral decision making were significantly negatively correlated, indicating that participants who had high psychopathy scores gave fewer altruistic decisions. In the regression model it was found that psychopathy scores were correlated with the moral decision making task but cortisol-change scores were not. This suggests that there may be an unassessed variable, such as psychopathic personality traits, that might be behind the relationship between cortisol and moral decision making as reported by others. Psychopathy and moral decision making were not found to be correlated with any of the other stress responses (heart rate, systolic blood pressure, diastolic blood pressure, and STAI-state). This warrants further investigation into the relationships between stress responses and moral decision making and stress and psychopathy to determine why the relationship only exists for cortisol change scores and not the others. These results also suggest that the relationship between stress and moral decision making is not linear, with the former predicting the latter as reported by literature, and that other possible factors play a moderating role in this relationship, with psychopathic personality traits being one possible factor.

For the moderated regression, it was found that the effect of psychopathic personality traits in moderating the relationship between cortical stress response and moral decision making approached significance, however, the results for all the regression models for all the other stress-change variables (heart rate, blood pressure, and STAI-state) were nonsignificant. The regression model with cortisol stress-change scores and the interaction between these and psychopathy scores demonstrated a moderating relationship. One possible reason for this variation could be the neural correlates associated with psychopathy and the endocrine stress response. A study done in 2009 found that the prefrontal cortex, amygdala, and hippocampus are involved in the regulation of the cortisol stress response (Dedovic, Duchesne, Andrews, Engert, & Pruessner, 2009), while a 2016 study demonstrated an inhibited role of the amygdala and prefrontal cortex, amongst other regions, in emotion regulation in psychopathic individuals (Pera-Guardiola et al., 2016). This sharing of neural correlates might explain why only the interaction between the cortisol stress response and psychopathy produced noteworthy results.

The findings of this study have also demonstrated that when sex and stress groups were looked at separately, the significant relationships were being driven by males and high stress groups. This makes it even more necessary to further study the differences in sex as they relate to both stress and psychopathy.

4.1 Strengths and Limitations

The implications of this study are of importance to the field of neuropsychology as they help understand the effects of stress on moral decision making while considering a possible moderator, psychopathic traits, to that relationship. This research has produced findings that are relevant to criminology (in light of the high prevalence of psychopathic personality disorders in criminals), and may help to inform possible rehabilitation and coping strategies in regards to dealing with every day stress and how it may affect the decisions made by psychopathic individuals. Additionally, this research also adds to the currently limited literature on stress and everyday moral decision making, while controlling for covariates. This study is different from existing literature (Singer et al., 2017; Starcke & Brand, 2012; Starcke et al., 2011) in that it not only considers a moderating relationship and extraneous variables that may impact the relationship between stress and moral decisions, it also aimed to look at sex-related differences, while taking into account and controlling for menstrual cycle phase and oral contraceptive use, to avoid variances in the results not related to the research question (Kirschbaum, Kudielka, Gaab, Schommer, & Hellhammer, 1999). In doing so the present study has also added to the rather limited literature on females with psychopathic traits and results have suggested a trend towards prominent sex differences that can now be further explored.

There are some limitations to this study that should be considered. Firstly, this study only tested participants for primary psychopathy, which is characterized by traits such as callousness, lack of remorse, selfishness, and manipulativeness, and did not test secondary psychopathic traits, including impulsivity and self-defeating behaviour (Levenson et al., 1995). Although both subscales collectively present a holistic picture of psychopathy, the decision to only use the primary psychopathy subscale was justified since it captures the traits that are central to psychopathy and were of interest for the purpose of this study.

Another limitation was the use of an opportunistic sample (i.e., participants from a departmental participant pool), which did not include other non-institutionalised individuals from the wider community. This too is justified as the sample was comprised of individuals who shared many demographic characteristics, thus the effects of extraneous variables were diminished reducing the statistical noise. More importantly, the sample size was quite small with only a 1:6 male to female ratio, making it impossible to make conclusive predictions about any possible moderating role psychopathic personality traits may be playing in the relationship between stress and moral decision making. While trends in sex differences were seen, it is quite possible that they were a result of statistical noise rather than holding any real implication. However, the high significance of these differences warrants further research to reach any conclusive decisions.

Lastly, unlike previous studies in this area, this study does not consider emotion ratings and certainty ratings regarding the decisions on the moral decision making task (Singer et al., 2017; Sommer et al., 2010). As part of the current study, those ratings were not of interest as they would not have impacted the implications and would have been beyond the scope of this study. However, the moral decision making task used in this study has high external validity and is similar to what can be encountered in real everyday life, which is more relevant to the purpose of this study.

4.2 Future Directions

Future research can expand on this current hypothesis by recruiting more participants, both males and females, to test whether the results from this study still hold true. It may also be of importance to test for sex differences in psychopathy itself since the literature lacks this aspect. The contradictory results for the relationship between stress and moral decision making as well as stress and psychopathy should also be further explored as no conclusive decisions can be made about these relationships at this point. Furthermore, it is recommended to account for other possible factors outside of personality that might moderate this relationship to better understand effects of stress and increased cortisol levels on moral decision making.

4.3 Conclusion

This study aimed to determine whether psychopathic personality traits moderates the relationship between stress and moral decision making. Previous research had demonstrated possible relationships between stress and moral decision making, with some contradictory suggestions. The current study was able to identify a possible moderating relationship between cortisol stress response and moral decision making when psychopathic personality traits were considered, however the effects on other stress responses were not seen. This opens up many possible future research options as something seems to be moderating the relationship between stress and moral decision, and it is worthwhile to examine what these factors might be.

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APPENDIX: Certificate of Ethics Approval

University of Regina

Research Ethics Board
Certificate of Approval

PRINCIPAL INVESTIGATOR	DEPARTMENT	REB#
Abeera Attiq	Department of Psychology	2018-194

SUPERVISOR
Dr. Laurie Sykes Tottenham

TITLE
Does stress influence the relationship between personality traits and decision making?

APPROVED ON	RENEWAL DATE
October 26, 2018	October 26, 2019

APPROVAL OF
Application for Behavioural Research Ethics Review; Participant Pool application; Consent form; Demographics and saliva screening; CBS; CESD; EMRT; LRSP; SDS; STAI-state; TSST high stress; and Debriefing form

Full Board Meeting ☐ Delegated Review ☒

The University of Regina Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol, or related documents.

Any significant changes to your proposed method, procedures or related documents should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

ONGOING REVIEW REQUIREMENTS
In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for the renewal and closure forms:
https://www.uregina.ca/research/for-faculty-staff/ethics-compliance/human/ethicsforms.html

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